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SUBJECT: Trip Report - ECS/Thermal  
Subpanel Meeting - 11/7/68  
Case 620

DATE: November 21, 1968  
FROM: D. G. Miller  
J. J. Sakolosky

ABSTRACT

The significant agenda items at the eighth ECS/Thermal  
Subpanel Meeting were:

Thermal Coating Degradation  
Cluster Leakage Rates  
Potable Water Transfer from CM to OWS  
Cluster Noise  
O<sub>2</sub> Accumulator - OWS Pressurization  
Waste Heat Data  
Minimum CLO Values  
RCS Plume Impingement on ATM Solar Array  
AM Equalization Valve  
OA External Radiation  
LM and CM/MDA Atmospheric Interchange.

The discussion generated by each of these items is  
briefly summarized.



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#### MEMORANDUM FOR FILE

The eighth ECS/Thermal subpanel meeting was held at MSFC on November 7, 1968. Representatives from MSC, MSFC, GAEC, MDC, NR, and Headquarters were in attendance. The authors attended for Bellcomm. Approximately two dozen agenda items were discussed at the meeting. The agenda is attached as Appendix A to this memorandum. A few select items from the agenda will be discussed herein. Persons desiring additional information on other agenda items may contact the authors.

Several handouts were distributed during the meeting. These pertain to cluster leakage rates, S-IVB waste heat loads, and radiator temperature maps for the Airlock Module. Additional information pertaining to various agenda items will be included in the official minutes of the meeting which will probably be available by the end of November.

#### Thermal Coating Degradation

MSFC has displayed concern over thermal coating degradation due to the space environment and because of contamination by urine dumping. MDC is to supply MSFC with coating degradation data and also look at the effects of urine dumping.

#### Cluster Leakage Rates

A handout was distributed by MSFC indicating module leakage rates for the AAP Clusters. Cluster leakage for AAP 1/2 and AAP 3A is given as 14.2 lbs/day; the leakage rate for AAP 3/4 is 19.9 lbs/day.

#### Waste Heat Data

MSFC presented an example of the type of waste heat data they would like for each of the AAP modules. The data are broken down into the sensible heat generated by sources (fans, lights, etc.) at different locations within the spacecraft. The data would then be combined with a mission timeline and metabolic loads to determine the waste heat load for a typical day. From this information dry bulb temperature, dew point, and wall temperatures for steady state and transient conditions in the various modules would be calculated.

Potable Water Transfer from CM to OWS

MSFC would like to transfer potable water manually from the CM to the food management section of the OWS. The water would then be distributed from the tank in the food management section to various other locations in the workshop by a preinstalled plumbing system.

MSC prefers to have a water line plumbed from the CM through the AM/MDA to the OWS tank. They object to the manual transfer on the grounds that it may prove to be a time consuming and frustrating task for the crew. It may be difficult for the crew to get at the water line in the CM, since stowed articles may have to be removed and replaced approximately once each day when the tank must be refilled.

MSFC objects to the MSC approach on the grounds that the water line may freeze and the plumbing adds additional complexity to the Cluster when it is not really required. There seemed to be differences of opinion as to which method the crew prefers. Both Centers agree that either method is feasible; the question is one of preference. NR is to look at the water transfer problem and present preliminary findings at the next scheduled ECS/Thermal subpanel meeting.

Cluster Noise

MSFC is collecting data from the various contractors for each of the noise generating sources (fans, compressors, etc.) aboard the Cluster. From this data, they will determine noise levels at various locations within the Cluster.

CLO Values

MSC performed an evaluation of CLO\* values and resolved that a CLO value less than .35 should not be used in thermal design. This lower limit is important since it determines allowable temperature and humidity levels for a given crew comfort criteria. A CLO value of .35 corresponds to the insulation level associated with a constant wear garment.

LM and CM/MDA Atmospheric Interchange

Both NR and Grumman agreed to an atmospheric interchange rate of 140 CFM to be supplied by the MDA interchange ducts to the LM and CM.

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\* CLO value refers to an insulation level associated with clothing.

AM Equalization Valve

McDonnell-Douglas is looking into an equalization valve that can be closed manually in the event the valve fails open. MDC stated their present valve does not provide redundant closing and could be a problem if failure occurred during an EVA.

OA External Radiation

NR and MSFC agreed to get together to resolve an external thermal interface between the SM and MDA. NR pointed out a temperature difference between the fuel cell radiators and the MDA radiator may result in significant radiant interchange.

O<sub>2</sub> Accumulator-OWS Pressurization

MDC performed an analysis to determine if the two O<sub>2</sub> accumulator bottles could pressurize the OWS for a leak check<sup>2</sup> during storage. This analysis indicated the resulting pressure in the OWS would be of too low a value to be read accurately on the high range pressure transducer and too high a value for the low range pressure transducers. It was decided to continue with further work to determine a method to leak-check the OWS during storage.

LM-A RCS Plume Impingement on ATM Stored Solar Arrays

This subject was discussed by Grumman at the last subpanel meeting, and MSFC was requested to determine solar panel temperature limits. MSFC reported it may be acceptable to exceed the 228°F temperature limit on the solar array under certain transient conditions. Temperature history influences the problem and expected transient conditions are being examined.

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-JJS-ms

Attachment  
Appendix A

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## APPENDIX A

### Eighth Thermal and Environmental Control System (ECS) Sub-Panel Meeting

Marshall Space Flight Center  
Room 2083, Bldg. 4610, 8:00 a.m. - 4:00 p.m.  
November 7, 1968

1. Bacteria/fungi/fungicide status MSC/MSFC comments
2. Coating degradation parametric study
3. Report on results of ECS duct design meeting November 6, 1968
4. Report on coating changes since last meeting, if any
5. Status of SR's and ICD's and ICDR's
6. Report on RCS time line
7. Leak rates for Cluster (MSFC) and updated expendables (MSC)
8. Status of MDC, NAR, GAEC reports on electrical power requirements for thermal control for potential inclusion in profile document
9. MSC evaluation of CLO values less than .35
10. Status report on OWS cabin fan relocation
11. Action Item 7-8, refer to Mechanical Panel, Request that plugs be installed in the OWS at earliest possible time to minimize leakage losses
12. AP characteristics of MDA high pressure line
13. MDA additional radiator location, dimensions, and temp. map
14. EVA hatch equalization valve redesign status
15. MDC evaluation of methods of protection in the event of a failed open equalization valve in the EVA hatch
16. Independent operation of mole sieve and H/E
17. Airlock electrical heater location and impact on MDA design

18. Configuration of ground/boost purge vent system
19. Pressure time line inconsistency for launch and ascent (AM-MDA)
20. Changes required to incorporate O<sub>2</sub> accumulator/leak check system
21. Plume deflector design and solar array allowable temps.

Items Added to the Agenda:

22. Water transfer from CM to OWS alternatives
23. Cluster noise
24. Cluster waste heat loads

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